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Characterization of Ce3+ and Yb3+ doped LiF-LuF 3-YF3 solid solutions as new UV active media

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Abstract

Here laser studies of Ce3+:LiLuxMe 1-xF4 (Me=Y3+,Yb3+) mixed crystals homologous to well-known Ce3+:LiYF4 and Ce 3+:LiLuF4 UV crystalline active media are reported. Optical spectroscopy and X-ray diffraction studies have proved scheelite structure of the investigated mixture crystals. Advantages of LiLuYF 4:Ce3++Yb3+ mixture crystals were detected. Among them an opportunity to wider tuning range of laser oscillation in comparison to LiLuF4:Ce3++Yb3+ active medium by means of varying YF3/LuF3 content relation. As it was shown from laser experiments mutual shift of 5d-4f emitting transition of Ce3+ ions and color centers absorption band due to lattice parameter change gives an optimum for YF3/LuF3 content relation corresponding to minimal overlap and maximal amplification band. EPR and optical spectroscopy revealed the optimum ratio of Y3+ ions and Lu 3+ in solid solutions of LiF-LuF3-YF3, where the segregation coefficient Ce3+ of ions is increased 3-5 times compared with crystals LiYF4 and LiLuF4. © 2011 SPIE.

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Keywords

5d-4f transitions of Ce3+ ions, Solid solutions, UV active media